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WATERSHEDS OF THE UMATILLA BASIN

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Introduction

A watershed is the land area that contributes water to a stream or river. Much conservation work within watersheds of the Umatilla basin is intended to maintain the quality of waters above current State of Oregon water quality standards. The total maximum daily load (TMDL) committee of the Umatilla Basin Watershed Council is organizing and gathering water quality information from several watersheds within the Umatilla basin. The committee is responsible for determining the TMDL values for pollutants that can enter the river or its tributaries yet maintain water quality at or above current State of Oregon water quality standards. The committee has also been assigned the task of providing management guidelines for improving water quality in streams where water quality is limited.

The watersheds within the Umatilla River basin extend from the highland headwaters of the North and South forks of the Umatilla to the flat dry irrigated lowlands near the Columbia River. Each watershed, characterized by a combination of hydrologic, soil, vegetation, and land-use, contains a different combination of water quality problems. Consequently each watershed will require its own set of management practices. The purpose of this article is to summarize the amount of rainfall, and land use as a percentage of area of forested land, rangeland, tilled agricultural land, and urbanized land in each watershed. Representative photographs illustrate further descriptions of watershed characteristics to provide the basis for understanding water-quality problems and developing guidelines for improving water quality within each watershed.

Methods

Watersheds within the Umatilla Basin are based on the fifth field hydrologic units of the US Geologic Survey (USGS). The TMDL technical committee adjusted some boundaries using sixth field boundary lines to incorporate similar areas into the same subwatershed. Land use categories and fraction of land use reported in Table 1 were obtained from the digital form of the 1971 USGS land use map in the TMDL data library using ArcView[1]. Precipitation ranges were obtained from the 1962 USDA Umatilla Basin Water and Related Land Resources report. Photographs were taken in February 1998 by the author.

Results

Thirteen watersheds subdivide the Umatilla River basin into its differing land use patterns. The boundaries of each of these watersheds are shown on the map of the Umatilla River basin (Fig. 1).

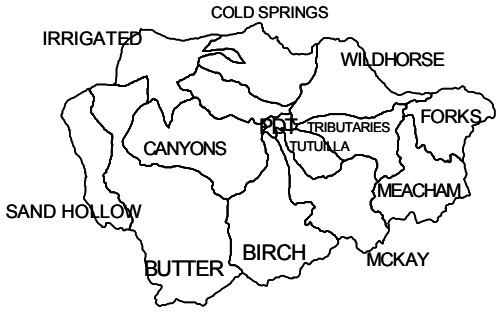

Figure 1. Watersheds of the Umatilla basin

The Sand Hollow watershed on the far west end of the basin does not drain water to the Umatilla River and the water from the Cold Springs watershed drains directly into the Columbia River. The names assigned to the watersheds that do provide water to the Umatilla are listed in Table 1 with their precipitation and land use characteristics.

[1] Use of product name does not imply endorsement or recommendation by USDA.

Table 1. General land use and precipitation range in watersheds of the Umatilla River.

Watershed Label	Range of annual Precipitation at highest elevation	at lowest elevation	Land Use Forested	Rangeland	Cropland / Pasture	Urban / Industrial
	Inches / year		Percent of area			
Forks	55	30	79	20	1	0
Meacham	45	30	76	22	0	1
McKay	32	15	37	44	16	1
Tributaries	30	15	18	44	36	1
Birch	30	15	22	42	35	1
Butter	30	10	7	72	20	1
Wildhorse	25	14	3	2	94	1
Tutuilla	24	13	0	17	78	4
PDT	15	13	0	11	57	32
Canyons	16	10	0	48	51	1
Stage	13	10	0	2	96	2
Irrigated	10	8	0	20	69	10
Irrigated	10	8	0	20	69	10

Beginning at the snow-capped headwaters of the river (Pl.1), the North and South Forks of the Umatilla River and the Meacham Creek watershed receive nearly 80% of the precipitation that eventually enters the river. Nearly 80% of these watersheds are forested. The remaining rugged sidehills are rangeland. The limited urbanization is restricted to the valley bottom of Meacham Creek, where the stream channel has been substantially modified and rearranged.

The Tributaries watershed contains many small streams, including Squaw Creek, Buckaroo Creek, Cottonwood Creek, Mission Creek and others, which frequently go dry at their mouths each summer. The landscape generally is very steep and dissected with deep canyons (Pl.2). Lessthan 20% of the land is forested but

Plate 1. Snow capped Forks and Meacham Creek headwaters of the Umatilla River from: Hwy 11, 8 mi. E. of Pendleton. February 1998.

Plate 2. View of Buckaroo Creek in the Tributaries watershed from north of Thornhollow. February 1998.

rangeland occupies over 40% of its area. About 1/3 of the area is cropland that is located along ridge tops and on the less sloping hillsides. The cropland is quite productive although it is highly susceptible to erosion by water because of the steep slopes and generally shallow soils.

The Wildhorse Creek watershed (Pl. 3) is one of the most intensively cropped of the Umatilla basin. Most of the land is gently-to-moderately sloping with relatively deep soils which leads to well over 90% of the area in crop or pasture. Wildhorse Creek flows year-round but the incised flood plane does not contribute to disbursing flood waters or supplementing summer flow as it did before the watershed was cultivated.

Plate 3. Agricultural fields dominate the Wildhorse watershed viewed looking North from Tubbs Ranch Road, 1 mile east of the Columbia Plateau Conservation Research Center. February 1998.

Water from the McKay Creek watershed (Pl.4) is stored each year in McKay reservoir. Originally constructed primarily for irrigation of lands downstream of Pendleton, trading of water available from the Columbia River has permitted some of the stored McKay water to be used as supplemental flow during mid-summer to enhance the survival of migrating fish. The large percentage of watershed with forest and rangeland cover has prevented rapid siltation of the reservoir. Homes, ranches and cultivated lands tend to be concentrated in the valley bottoms of the watershed where their impact overshadows their relatively sparse numbers.

Plate 4. McKay Creek valley and snow capped headwaters viewed from the Pendleton airport. February 1998.

The Birch Creek watershed (Pl.5) is slightly lower and drier than the McKay watershed and has a larger amount of cropped land. There is no storage reservoir on Birch Creek and the community of Pilot Rock and the irrigated cropland along the valley floor utilize its water extensively. Water flows throughout the year in Birch Creek but the low flow in mid-summer is accentuated by many withdrawals of water along the full length of the creek.

Plate 5. Cropland along the valley bottom of Birch Creek viewed looking North, down stream from Pilot Rock. February 1998.

The Canyons watershed (Pl.6) contributes water to the Umatilla River only during the spring and then mostly as runoff from agricultural croplands. The rangeland of the area is often quite steep and the cropland is located on the more gently

sloping hilltops. The watershed characteristically is quite dry with no forested land at higher elevations.

Plate 6. The Canyons watershed, eastern end, viewed from the Pendleton airport. February 1998.

Stage Gulch watershed is as intensively cultivated as Wildhorse even though it receives significantly less precipitation. The land in Stage Gulch is dissected by deeper valleys than in Wildhorse but not as deep as those of the Tributaries watershed. Soils are generally coarser in texture than those in Wildhorse and blowing dust from wind erosion can be a serious problem. Historically nearly all crops in the Stage Gulch watershed were produced in a rotation including fallow every other year. Fallow leaves the soil bare for one growing season, saving water for use by the next crop. The Wildhorse watershed generally receives sufficient precipitation to produce a crop every year. Stage Gulch does not provide a perennial flow to the Umatilla River but does contribute cropland-runoff flow in the spring of each year.

The Tutuilla watershed is heavily cropped land sandwiched between the Tributaries and McKay watersheds. It has neither high elevation land with forest nor extended snowpack accumulation. There is a growing urbanization of this watershed as many small areas have been subdivided to provide country homes. The water in Tutuilla and Patawa Creeks is used extensively for irrigation. Well water, also used for irrigation, contributes to a small but continuous flow into the Umatilla River throughout the summer. Unfortunately because of the low volume of flow, the water can be quite warm and contain a relatively high concentration of pollutants.

The highly urbanized area surrounding Pendleton has been assigned its own watershed name of PDT. This "watershed" was created to deal with the unique water runoff and pollutants characteristic of a city and industrialized areas.

The Irrigated watershed near the mouth of the Umatilla River receives most of the flow from the Umatilla River during the summer growing season. It also contains a large urban and industrial area. In the past, all water was diverted from the river each summer. With the success of Phase II of the Umatilla Basin Project, a year-round, continuous flow has been established in the river; consequently, ocean migrating fish have been successfully reintroduced. There are several overland return flows and complex patterns of ground water returning to the river from irrigated land along the river. The combination of dissolved salts in the returning water, municipal effluent, and the characteristic seasonal low flow during the summer has led to excessive concentrations of some pollutants in the Umatilla in the Irrigated watershed. These pollutants are not necessarily originating only from the Irrigated watershed.

The combined practices of land and water use from the watersheds upstream are culminating in the Irrigated watershed. With an understanding of the supply of water and land use that exists in each of the watersheds of the basin, it will be possible to recommend management practices suitable for each watershed to bring water quality within acceptable standards for the entire Umatilla basin.